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Dünn

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(54) **DRY OPERATING SCREW-TYPE COMPRESSOR WITH PNEUMATICALLY CONTROLLED AIR RELIEF VALVE**

(75) Inventor: **Hans Dünn**, Bergisch Gladbach (DE)

(73) Assignee: **Dienes Werke Fur Maschinenteile GmbH & Co.** (DE)

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(51) **Int. Cl.**
F04B 49/00 (2006.01)

(52) **U.S. Cl.** **417/310**

(58) **Field of Classification Search** 417/295, 417/296, 307, 310, 53; 418/201.1, 201.2; 137/614.2, 616.7
See application file for complete search history.

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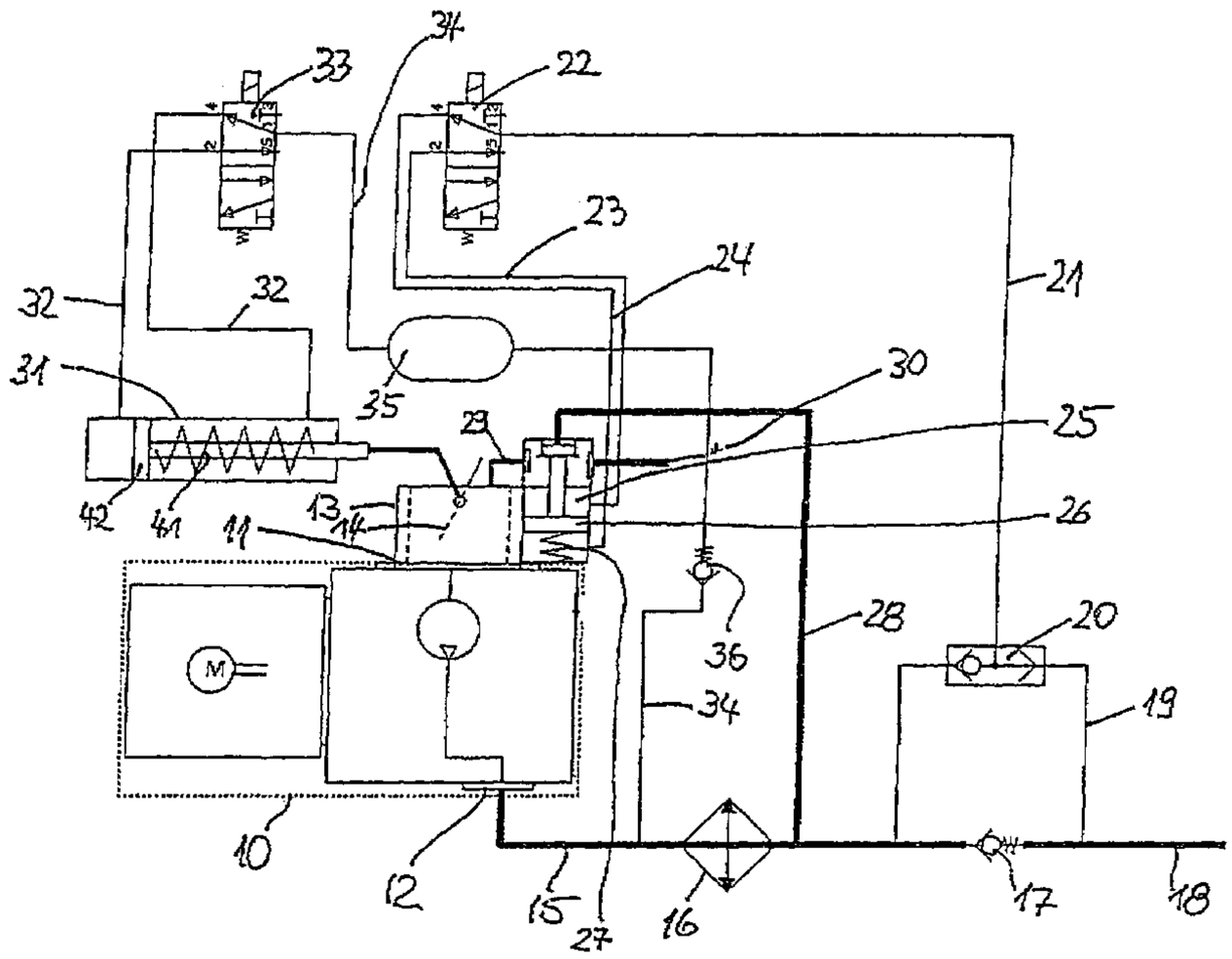
Primary Examiner — Devon C Kramer
Assistant Examiner — Amene S Bayou
(74) *Attorney, Agent, or Firm* — Robert Becker; Robert Becker & Assoc.

(57) **ABSTRACT**

A screw-type compressor having a motor driven and dry operating compressor unit. A butterfly valve is disposed in an intake line connected to the suction side of the compressor unit. An adjustment cylinder mechanically shifts the butterfly valve. A pressure line is connected to the pressure side of the compressor unit and, via the interposition of a check valve, is connected to a compressed air system. The pressure line is connected to a pneumatically controlled air relief valve via an air relief line for relief of pressure during idling of the compressor unit. At least during idling, the air relief valve is adapted to be acted upon by the pressure that is effective on the pressure side of the compressor unit.

15 Claims, 6 Drawing Sheets



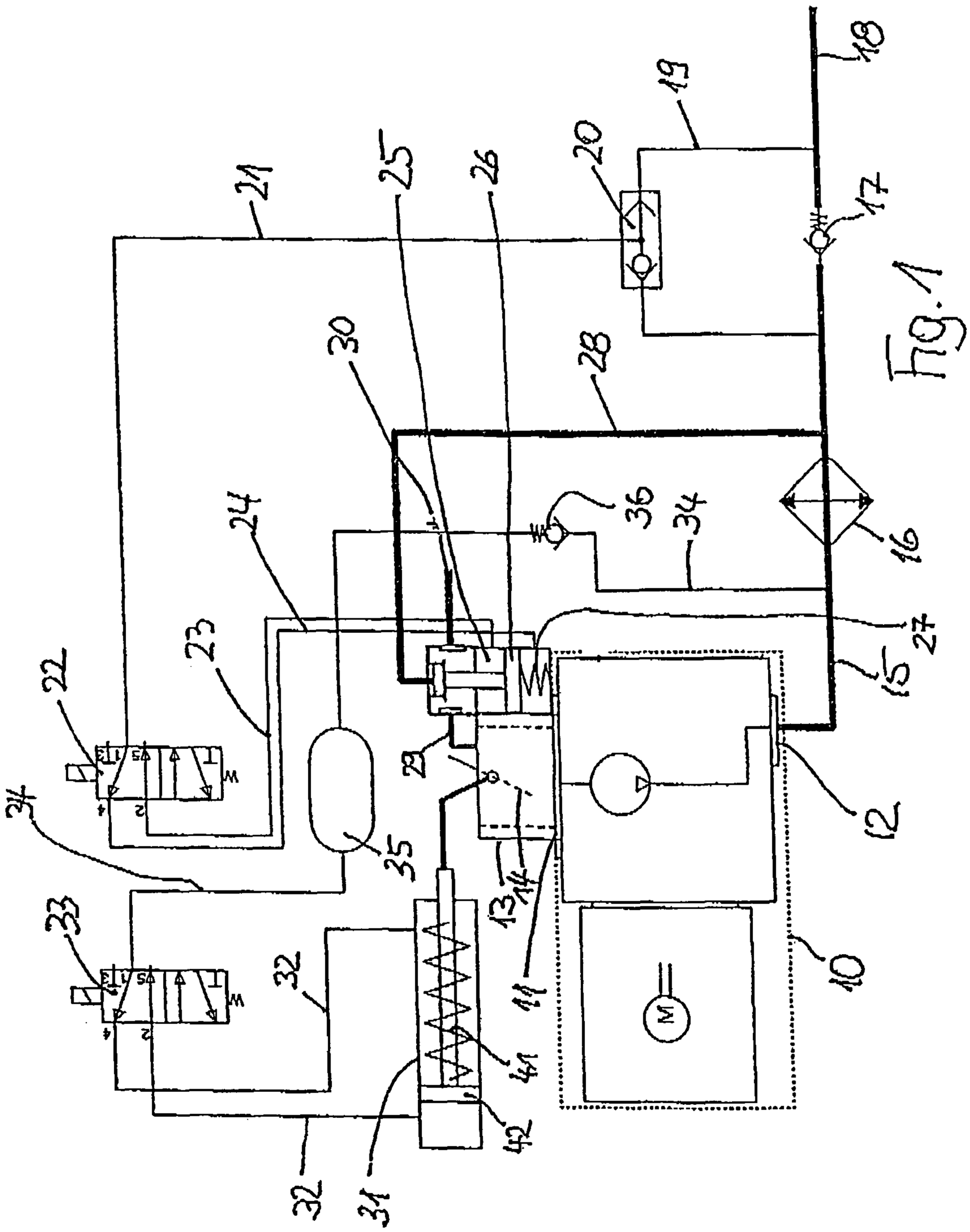

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Fig. 1

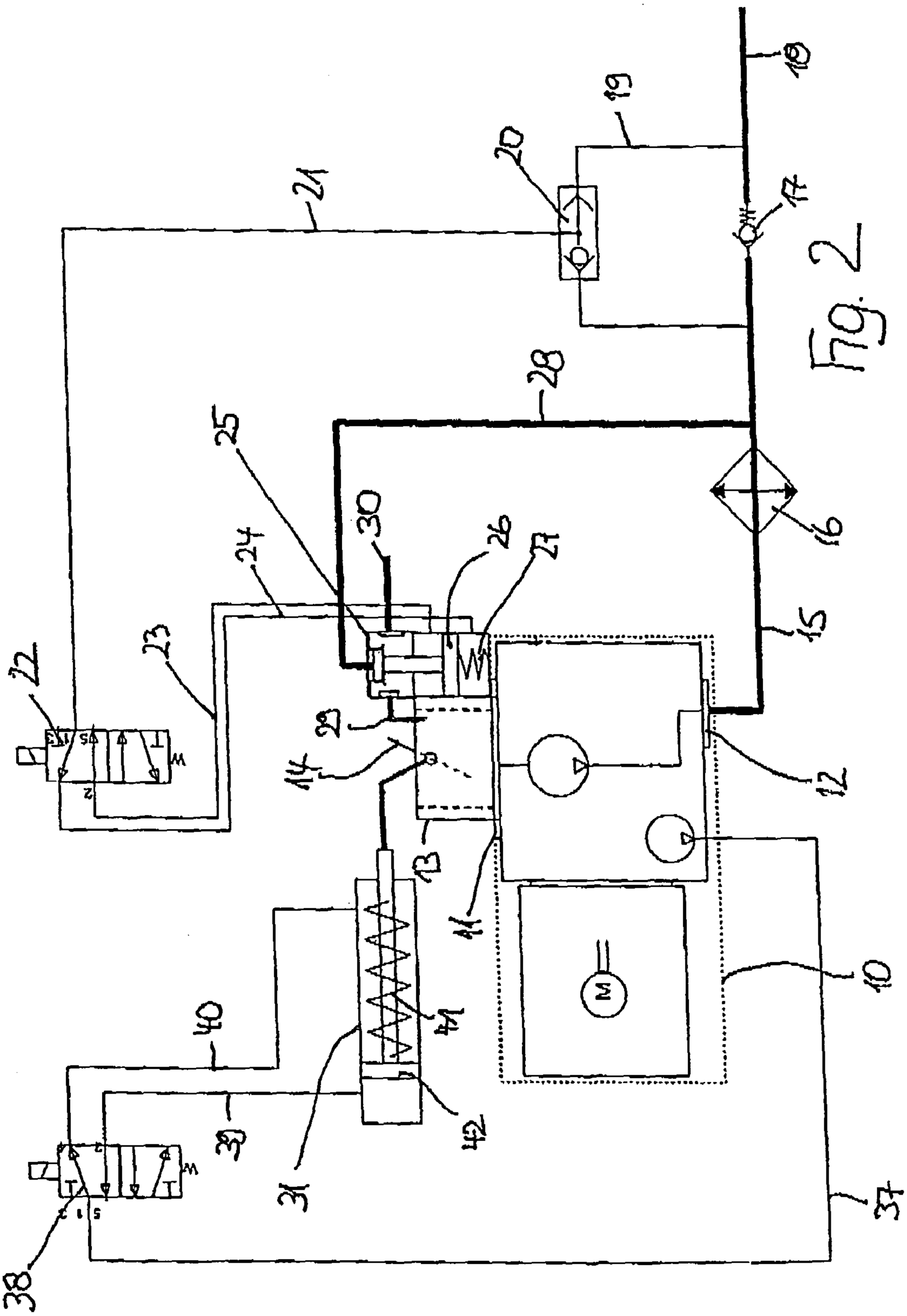
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Fig. 2

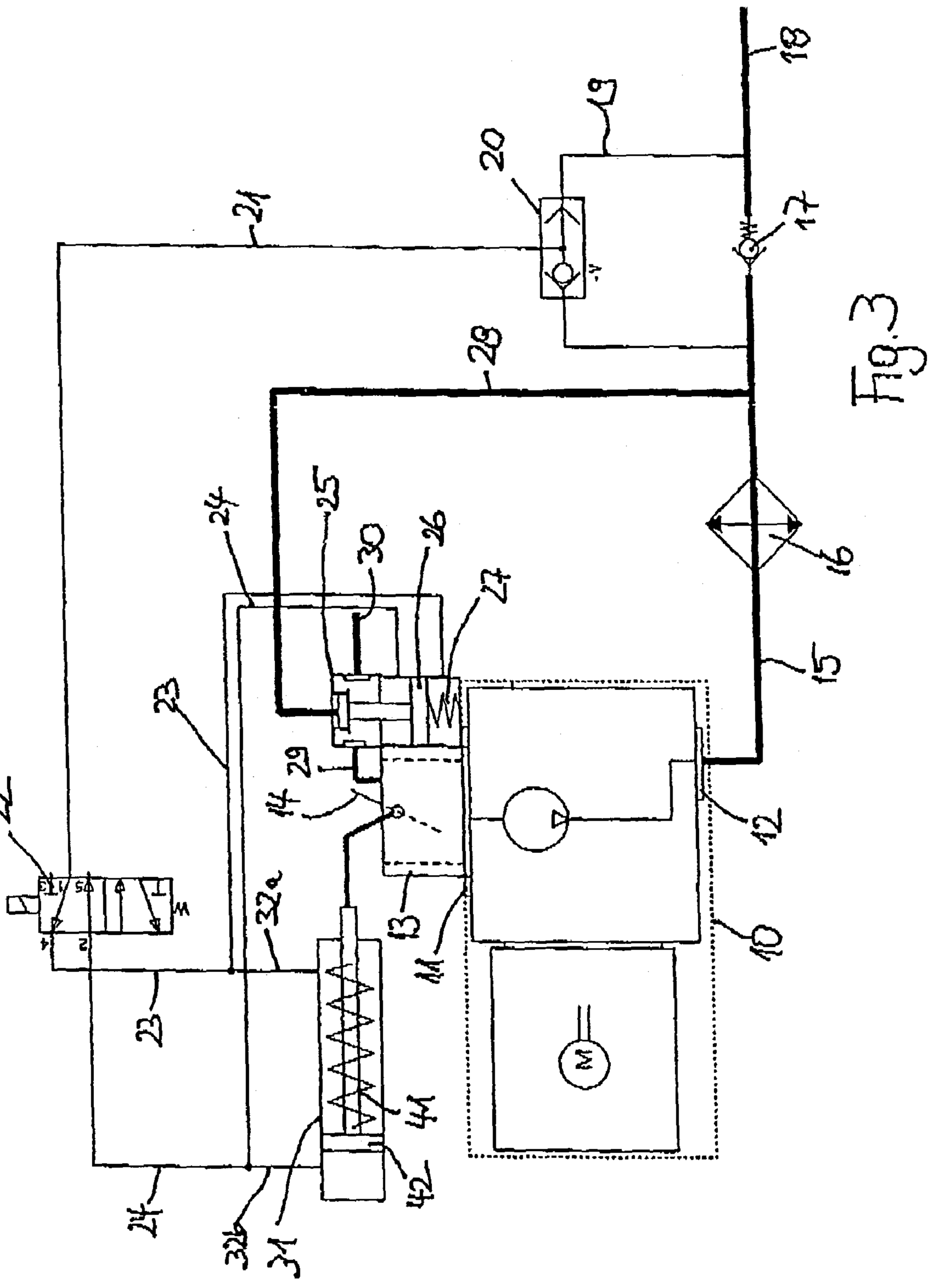
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Fig. 3

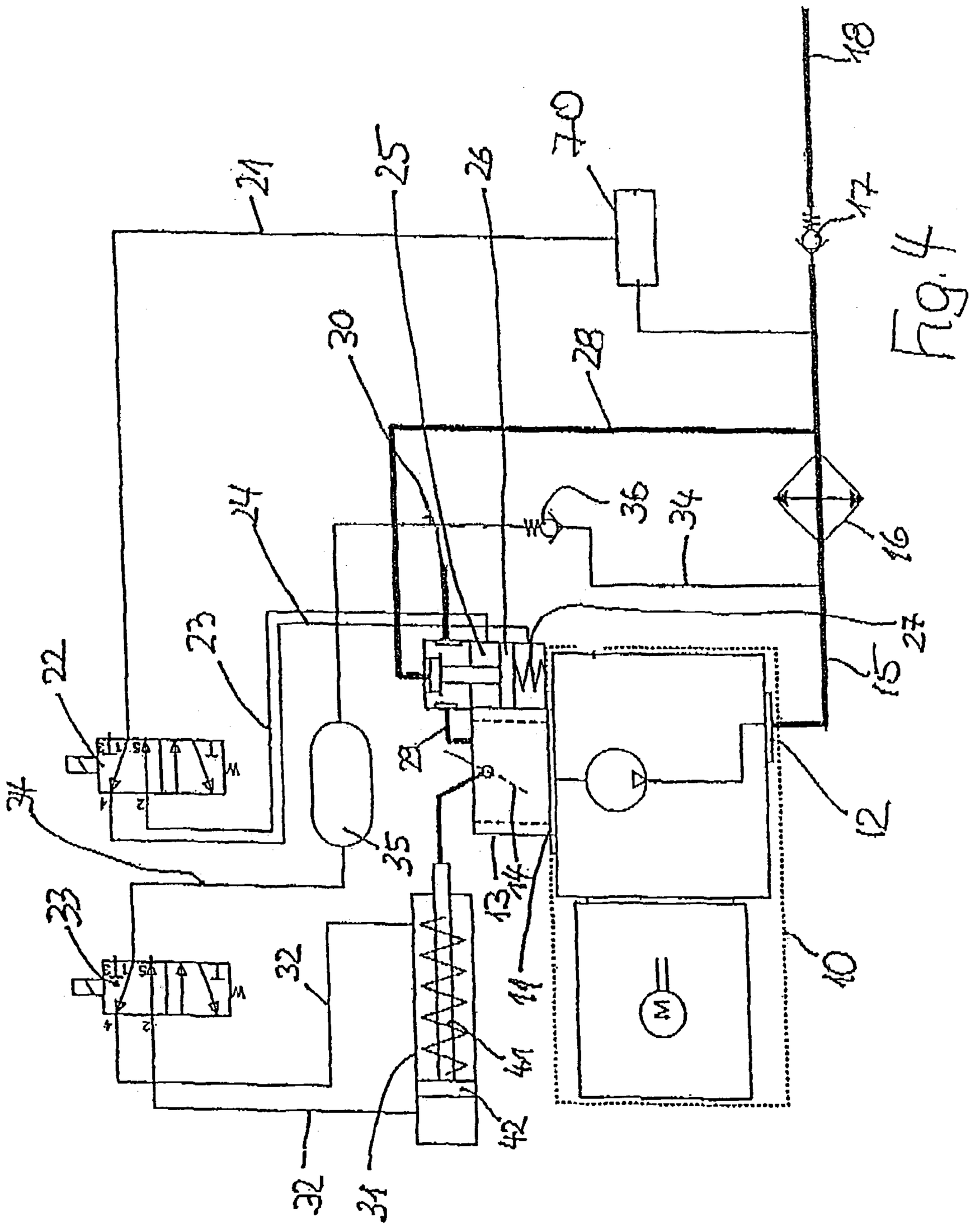
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Fig. 4

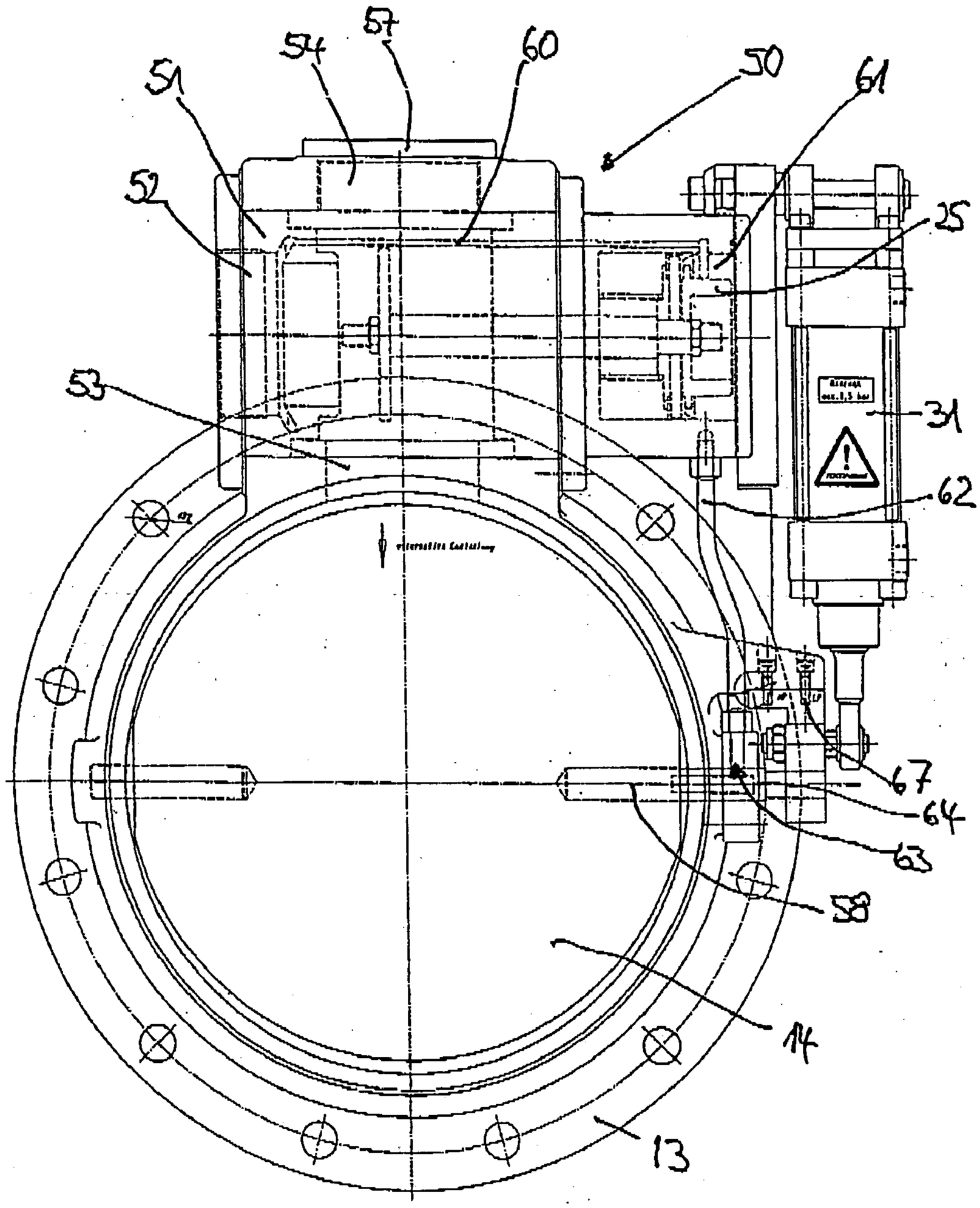

Fig.5

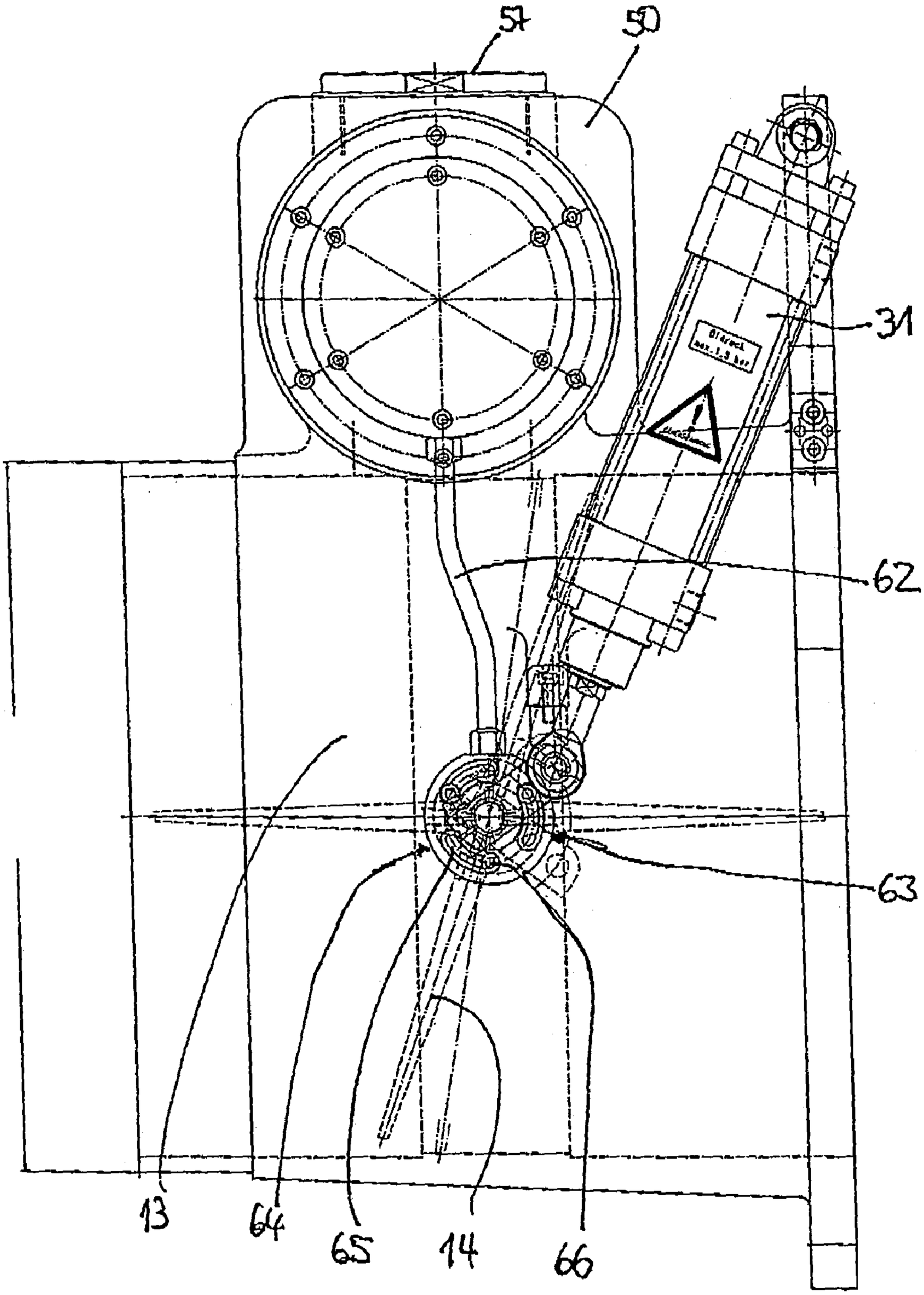

Fig. 6

DRY OPERATING SCREW-TYPE COMPRESSOR WITH PNEUMATICALLY CONTROLLED AIR RELIEF VALVE

The instant application should be granted the priority date of Aug. 30, 2005, the filing date of the corresponding German patent application 10 2005 040 921.0.

BACKGROUND OF THE INVENTION

The present invention relates to a screw-type compressor with a motor driven and dry operating compressor unit having a suction side and a pressure side, whereby the suction side is connected to an intake line with a throttle or butterfly valve, which is located inside the intake line and can be displaced mechanically by means of an adjustment cylinder, whereby the pressure side is coupled to an outwardly extending pressure line, which, for the supply of the compressed air, and through the intermediary of a check valve, is connected to a compressed air system, and whereby the pressure line is connected to an air relief valve via an air relief line for the relief of pressure during idling operation of the compressor unit as a result of the butterfly valve being located in a position allowing only a small cross-sectional opening area or as a result of the butterfly valve being located in a completely closed position.

Screw-type compressors in general have the problem that, in the case of a displacement of the butterfly valve into its closed position, depending on the inherently present pressure in the associated compressed air system that is to be supplied, the difference in pressure between the suction side and the pressure side of the compressor unit increases continuously, so that the compression output that is to be performed by the compressor unit increases correspondingly. In screw-type compressors that are configured with an oil-flooded compressor unit, the thereby resulting increased heat is dissipated via the lubricating oil circuit of the compressor unit. In oil-free or, in other words, dry operating compressor units, the pressure side of the compressor unit is relieved, during idling operation of the aforementioned kind, by means of a correspondingly located air relief valve. The development of a difference in pressure is hence prevented so that, during the idling operation, the compressor unit does not work against the inherently present pressure on the pressure side and, hence, no additional heat stress results.

A screw-type compressor of the aforementioned kind is known from use according to the brochure "Stationary oil-free screw-type compressors; the T-series, dual stage, T60Z through T240Z" by ECOAIR from May 1996. In that screw-type compressor, the actuation of the butterfly valve that is located in the intake line is realized by means of an associated adjustment cylinder, which is acted upon by the oil pressure that serves for lubricating the bearing of the compression unit. The provided air relief valve is mechanically coupled to the adjustment cylinder or, respectively, to the displacement of the butterfly valve, resulting in a forced synchronization of the position of the butterfly valve and the opening state of the air relief valve.

Associated with the known structural configuration is the disadvantage that, due to the mechanically realizable surface conditions, the mechanical actuation of the air relief valve requires significantly higher actuating forces and therefore higher oil pressures than necessary or present for the lubrication of the compressor unit. Furthermore, an adaptation of the air relief to single or dual stage compressor units is only possible by using different and distinct mechanical components. Finally, due to the high temperature of the compressed medium, preferably a gas at approximately 200 to 240° Celsius, and therefore the necessity to use specific materials or, respectively, coatings, the expenditure for the manufacturing of the mechanical configuration is correspondingly high.

It is therefore an object of the present application to make the actuation of the air relief valve on a screw-type compressor of the aforementioned kind easier and more expedient.

SUMMARY OF THE INVENTION

The fundamental concept of the invention is that the air relief valve is controlled pneumatically and that it is acted upon, at least during the idling operation of the compressor unit, by the pressure effective on the pressure side of the compressor unit. The invention has the advantage that the inherently present energy on the pressure side of the compressor unit is used to actuate the air relief valve. The mechanical uncoupling of the intake control by the displacement of the butterfly valve on the one hand and the correspondingly necessary air relief by the control of the air relief valve on the other hand results in a higher degree of freedom concerning the configuration of the screw-type compressor. Thus, the mechanical uncoupling enables a proportional regulation of the quantity delivered by the compressor unit, because the control of the air relief valve can be realized independently from the position of the butterfly valve. Furthermore, since the displacement of the butterfly valve is independent from the position of the air relief valve, the requirement for varied idling intake volumes can be met by means of different positions of the butterfly valve. Thus, different configurations for single or, respectively, dual stage compressor units are unnecessary, resulting in a significant cost advantage. Finally, due to the mechanically uncoupled functions of the butterfly valve displacement and the air relief, a more compact configuration of the entire screw-type compressor is possible, which likewise leads to reduced costs and a lower weight per unit. The adjustment cylinders, which are still necessary for the actuation of the butterfly valves, can thereby be dimensioned significantly smaller due to the reduced oil pressure. The use of standard cylinders is sufficient.

If the user of the compressor refrains from using the aforementioned advantage of a proportional regulation of the quantity delivered, a forced pneumatic control between the position of the butterfly valve and the regulation of the air relief valve can be integrated, according to the mechanical solution. Thus, the pneumatically controlled control unit according to the invention becomes compatible without limitation and can even be utilized for replacement on screw-type compressors that are presently being used.

According to one embodiment of the invention, with regard to a proportional regulation of the quantity delivered, the control air connections, which are located in the air relief valve on both sides of a valve piston that is movable in the air relief valve, are connected, through the intermediary of a switching valve that controls the valve piston, to the pressure side of the compressor unit via a control air line. The pressure conditions of the control air with regard to the desired position of the valve piston in the air relief valve can be adjusted by means of the switching valve or an alternatively applicable control valve.

According to one embodiment of the invention, in order to provide sufficient pressure for the control of the valve piston in the air relief valve, the control air line is connected to the pressure line and is provided with a pressure reservoir for maintaining the pressure that is present in the pressure system. Alternatively, a bypass with an included pressure valve,

bypassing an intermediary check valve, can be located between the pressure line and the pressure system. Via the pressure valve, which has two switching positions, the bypass connects the control air line either with the pressure line or with the pressure system. In this configuration, depending on the inherently present pressure in the pressure line upstream of the check valve or in the pressure system downstream of the check valve, the respectively higher pressure is utilized for the actuation of the air relief valve.

According to one embodiment of the invention, the adjustment cylinder for the displacement of the butterfly valve can be actuated by means of the oil pressure that acts upon the compressor unit. For this purpose, the adjustment cylinder is connected, via a switching valve and a control oil line, to the lubricating oil circuit for lubricating the bearings of the compressor unit.

As an alternative, it is possible to actuate the adjustment cylinder for the displacement of the butterfly valve pneumatically. For this purpose, the adjustment cylinder for the displacement of the butterfly valve can be operated pneumatically and can be connected, with its control air connections, to the pressure side of the compressor unit via a control air line through the intermediary of a switching valve. In conformity with the alternative possibilities for supplying the air relief valve with control air, the supply of control air for the adjustment cylinder can be realized in that the control air line for the adjustment cylinder is connected to the pressure reservoir, or in that the adjustment cylinder is connected, with its control air connections, in a parallel connection in relation to the air relief valve, to connection lines that extend between the air relief valve and the switching valve for the control air. In the last case, only one switching valve is necessary for the mutual control of the position of the butterfly valve and of the air relief valve, and a mutual switching time is set for the idling operation or, respectively, the operation under load.

According to one embodiment of the invention, a forced pneumatic control between the position of the butterfly valve and the actuation of the air relief valve is possible as well. Therefore, according to one embodiment of the invention, the piston chamber of the air relief valve, which during the idling operation has to be acted upon by pressure in order for the piston to move into its closed position for the air relief line, is connected to the air relief line via a pressurizing line. A pressure relief line having a pressure relief valve is connected to the piston chamber, whereby a forced control between the position of the butterfly valve and the position of the pressure relief valve is effective.

In particular, the pressure relief valve can be located in the area of the hub of the butterfly valve. The pressure relief valve can thereby be configured as at least one opening that is located in the hub of the butterfly valve and that can be opened and closed infinitely, depending on the position of the butterfly valve.

In one embodiment of the invention, the opening is configured as a slot that extends through a part of the perimeter of the hub in an annular manner and is connected to the pressure relief line on the inside. The opening cross-section of the slot can be adjusted by means of an adjusting member that is connected to the butterfly valve and determines the opening cross-section of the slot.

According to one alternative embodiment of the invention, the pressure relief valve can be configured as a notch or recess that is located in the shaft of the butterfly valve and extends from a connection of the pressure relief line located in the area of the hub to the outside of the hub.

According to one embodiment of the invention, the hub is provided with several relief openings.

According to one embodiment of the invention, the air relief valve has two connections for the blow-off air that is to be conducted away. One of the two connections, which can be used selectively, is connected to the intake line, and a muffler for the blow-off air is attached to the other connection. The valve seat for connecting the air relief line to the air relief valve can be configured so as to be pivotable in the air relief valve for the selective use of the connections.

One embodiment of the invention, in particular for screw-type compressors having a forced coupling of the position of the butterfly valve and the position of the air relief valve, is provided with a stop element for the fixation of the end closed position of the butterfly valve. It serves for setting the idling intake volume on single or multi stage screw-type compressors. Due to the arrangement of this stop element, the entire intake and air relief unit can be attached both to single or multi stage screw-type compressors, because by means of the position of the stop unit, the idling intake volume can be changed or set in a simple manner.

Embodiments of the invention, which are described below, are represented in the drawings, in which:

FIG. **1** shows a circuit diagram for actuating, by means of control air, the adjustment cylinder that controls the butterfly valve and the air relief valve for a proportional regulation of the quantity delivered,

FIG. **2** shows the circuit diagram according to FIG. **1**, whereby the adjustment cylinder is connected to the lubricating oil circuit of the compressor unit,

FIG. **3** shows a circuit diagram for actuating, by means of control air, the adjustment cylinder for the control of the butterfly valve with a common switching location for the load position and the idling position of the butterfly valve and the air relief valve,

FIG. **4** shows an air relief valve in a configuration for a proportional regulation of the quantity delivered in a partially sectioned front view,

FIG. **5** shows the air relief valve according to FIG. **4** in a configuration with a forced coupling between the position of the butterfly valve and the control of the air relief valve, and

FIG. **6** shows the subject matter according to FIG. **5** in a side view.

DESCRIPTION OF SPECIFIC EMBODIMENTS

The configuration of the screw-type compressor according to the invention is first described for different embodiments with the aid of the circuit diagrams represented in FIGS. **1** through **3**, which show the association of the connections or, respectively, the connecting lines.

A compressor unit **10** with a drive motor has a suction side **11** and a pressure side **12**. On its suction side **11**, the compressor unit **10** is connected to an intake line **13** in which a butterfly valve **14** is located so as to be displaceable into different opening positions. On its pressure side **12**, a pressure line **15** extends away from the compressor unit **10** and through an intermediate cooler or intercooler **16** and a back-pressure or check valve **17**. After the check valve **17**, the pressure line **15** is connected to the compressed air system **18**, into which the compressed air is to be introduced. In the embodiment represented here, an air relief line **28**, disposed downstream of the intercooler **16**, extends away from the pressure line **15**. The air relief line **28** enables the relief of pressure on the pressure side **12** during the idling operation of the compressor unit **10** and is connected to an air relief valve **25**, which is structurally integrated into the compressor unit **10**.

The pneumatically operated air relief valve **25** is integrated into a control circuit in the following manner: The air relief valve **25** has a valve piston **26** that is acted upon by a spring **27** and serves for closing the inlet of the air relief line **28** into the air relief valve **25**. Connected on both sides of the valve piston **26** are corresponding connection lines **23** and **24** that serve as control air connections and extend to a switching valve **22**, which in turn is supplied by a control air line **21**. The control air line **21** extends to a pressure valve **20** that is disposed in a bypass **19**, which by-passes the check valve **17** that is located between the pressure line **15** and the pressure system **18**. Due to this configuration, the pressure present in the control air line **21** is always equal either to the pressure present in the pressure line **15** or, respectively, in the pressure system **18**, depending on which pressure is higher.

The air relief valve **25** has an outlet **30**, which releases, in an advantageous manner via a not represented sound absorber or muffler, the blow off air into the atmosphere. The air relief valve **25** furthermore has a second outlet **29** that is connected to the intake line **13** so that, alternatively, the blow off air that is conveyed through the outlet **29** of the air relief valve **25** can be released into the intake line **13** and hence kept in the circuit.

In order to be displaceable, the butterfly valve **14** is mechanically connected to an adjustment cylinder **31**, which, in the embodiment represented here, is likewise actuated pneumatically. For this purpose, connection lines **32***a, b* are connected to the adjustment cylinder **31** in a known manner. The connection lines **32***a, b* both lead to a switching valve **33** that is connected to a control air line **34**. The control air line **34** extends, via a pressure reservoir **35** and a back-pressure or check valve **36**, to the pressure line **15** and, in the embodiment represented here, is connected to the pressure line **15**, relative to the direction of flow, upstream of the intercooler **16**.

According to the represented circuit diagram, a proportional regulation of the quantity delivered is possible because both the adjustment cylinder **31** and the air relief valve **25**, respectively, can be controlled independently since they are connected to separate control air supplies. In order to displace the butterfly valve **14** into its closed position, control air that flows through the pressure line **15** acts upon the adjustment cylinder **31**, corresponding to the position of the switching valve **33**. The built in pressure reservoir **35** thereby ensures that—even in the case of a decrease in pressure in the pressure line **15**—a sufficient amount of pressure for the displacement of the butterfly valve **14** is available.

Regardless of that, the air relief valve **25** can be acted upon via the control air line **21** and the switching valve **22**. The air relief valve **25** opens the air relief line **28** to the desired extent so that the pressure in the pressure line **15** is relieved, associated with an increasingly closed position of the butterfly valve **14**. If the compressor unit **10** is to be operated under load again, the butterfly valve **14** is opened by means of control air and, simultaneously, the air relief valve **25** closes the air relief line **28**.

The embodiment represented in FIG. **2** differs from the embodiment represented in FIG. **1** in that the adjustment cylinder **31** is actuated by the oil pressure of the lubricating oil circuit that serves for lubricating the bearings of the compressor unit **10**. For this purpose, a control oil line **37** extends from the compressor unit **10** to a switching valve **38**. Connection lines **39** and **40** extend from the switching valve **38** to the adjustment cylinder **31** and are each connected to one of the two pressure chambers of the adjustment cylinder. A valve spring **41** acts upon the piston **42** that separates the two pressure chambers. The control of the air relief valve thereby remains unchanged.

In the embodiment represented in FIG. **3** both the adjustment cylinder **31** and the air relief valve **25** are again operated pneumatically, whereby only a single switching valve **22** is provided, which, in a single switching time, switches both the adjustment cylinder **31** and the air relief valve **25** into the idling position or, respectively, into the load position. The supply of control air via the control air line **21** to the switching valve **22** is therefore realized as described in accordance with FIG. **1**. Likewise, the connection of the air relief valve **25** to the switching valve **22** via the connection lines **23**, **24** is unchanged.

The pneumatically operated adjustment cylinder **31** with its control air lines **32***a, b*, however, is now connected, in a parallel connection in relation to the air relief valve **25**, to the connection lines **23**, **24** and therefore to the switching valve **22**. If the switching valve **22** switches to the idling position, the adjustment cylinder **31** is simultaneously forced to close the butterfly valve **14**, and the air relief line **28** in the air relief valve **25** is opened. The blow off air that flows into the air relief line **28** due to the relief of pressure in the pressure line **15** flows off either via the outlet **29** into the intake line **13** or via the outlet **30** and via the muffler, depending on the setting of the connection. When switched to the load position, the butterfly valve **14** is opened and the air relief valve **25** is closed.

FIG. **4** shows a structural configuration of a pneumatically operated air relief valve that is attached to the compressor unit **10** or, respectively, to the intake line **13** in accordance with the representation in FIGS. **1** through **3**. The butterfly valve **14** is located in the intake line **13** so as to be pivotable. The air relief valve **50** has a valve seat **51** with a connection **52** for the air relief line **28**. Furthermore, the air relief valve **50** has a connection **53** that extends into the intake line **13** and alternatively a connection **54** for an exhaust air line that leads to a muffler. In the embodiment represented here, a lid **57** covers the connection **54**. The air relief valve **50** has, in accordance with the representation in FIGS. **1** through **3**, a piston chamber **55** in which the valve piston **26** of the air relief valve **50** is movable. The connections **56** for the connection lines **23**, **24** are indicated in the two parts of the piston chamber **55** that are separated by the valve piston **26**. The reference numeral **23** indicates the connection for the connection line that is acted upon by pressure during the idling operation; when the control air acts upon it, the valve piston **26** is moved to the right and therefore opens the valve seat **51** for the inflow of exhaust air through the connection **52**. When the connection line **24** is acted upon by pressure, the valve piston **26** is moved to the left into its closing position. The arrangement of an adjustment cylinder **31** and its connection to the shaft **58** of the butterfly valve **14** is only represented schematically. In the embodiment represented here, the adjustment cylinder **31** is acted upon by means of control oil.

The embodiment represented in FIGS. **5** and **6** shows a forced pneumatic control between the position of the butterfly valve and the actuation of the air relief valve. Hence, the piston chamber **61**, which has to be acted upon by pressure in order to move the valve piston to the left into its closing position, is constantly connected to the air relief line **28** via a pressurizing line **60** that is located on the inside. Consequently, the pressure that is present in the piston chamber **61** is always equal to the pressure on the pressure side **12** of the compressor unit **10**. When the butterfly valve **14** is open, that pressure keeps the valve piston **26** in a closing position with regard to the connection **52** for the air relief line **28**. A pressure relief line **62** extends from the piston chamber **61** that is acted upon by pressure to a pressure relief valve **63**, which, depending on the position of the butterfly valve **14** in the

intake line **13**, can be opened and closed. In the area of the hub **64**, the shaft **58** of the butterfly valve **14** can hereby be provided with a recess that extends from a connection of the pressure relief line **62** to the outside of the hub **64** so that a control edge is formed in the transition between the connection of the pressure relief line and the recess. The switching time for the release of the air relief valve can be set or adjusted by means of the position or, respectively, the adjustment, of the control edge.

If the butterfly valve is displaced from the open position into the closed position, which is represented in FIGS. **5** and **6**, the pressure relief opening that is connected to the pressure relief line **62** is opened simultaneously so that the pressure that acts upon the pressurizing line **60** can escape from the piston chamber **61**. Hence, the pressure present in the piston chamber **61** is no longer sufficient for keeping the piston **26** in its closed position, so that the closing of the butterfly valve **14** brings about the opening of the connection **52** for the air relief line **28**. Depending on the position of the butterfly valve **14**, the connection **52** is opened more or less so that a direct coupling between the position of the butterfly valve **14** and the position of the air relief valve **50** is realized. Due to the adjustable stop **67** for positioning the butterfly valve **14** at the desired idling volume, the entire intake and air relief unit can be attached, in a simple manner, to either single or multi stage screw-type compressors. This is because by means of the stop **67**, the end closing position of the butterfly valve **14** and therefore the idling intake volume can be adjusted according to the configuration of the compressor.

The features of the subject matter of these documents, disclosed in the above description, in the patent claims, in the summary and in the drawing, can be essential separately or in any combination with each other for the implementation of the various embodiments of the invention.

The specification incorporates by reference the disclosure of German priority document 10 2005 040 921.0 filed 30 Aug. 2005.

The present invention is, of course, in no way restricted to the specific disclosure of the specification and drawings, but also encompasses any modifications within the scope of the appended claims.

What I claim is:

1. A screw-type compressor, comprising:

a motor driven and dry operating compressor unit that has a suction side and a pressure side;

a butterfly valve disposed in an intake line connected to said suction side of said compressor unit;

an adjustment cylinder that is adapted to mechanically shift said butterfly valve;

a pressure line connected to said pressure side of said compressor unit, wherein said pressure line, via the interposition of a check valve, is adapted to be connected to a compressed air system for a supply of compressed air thereto; and

a pneumatically controlled air relief valve, wherein said pressure line is connected to said air relief valve via an air relief line for a relief of pressure during idling of said compressor unit, and wherein at least during idling of said compressor unit said air relief valve is adapted to be acted upon by the pressure that is effective on said pressure side of said compressor unit, wherein a valve piston is movably disposed in said air relief valve, wherein control air connections are provided in said air relief valve on opposite sides of said valve piston, wherein a first switching valve that controls said valve piston is connected to said control air connections, and wherein a control air line connects said first switching valve to said pressure side of said compressor unit, and wherein the control air line are always connected with the pressure side of the compressor unit, so that said valve piston is moved by the pressure existing on the pressure side of the compressor unit,

wherein a bypass is disposed between said pressure line and the compressed air system, wherein said bypass bypasses said check valve, wherein a pressure valve that has two positions is disposed in said bypass, and wherein said control air line is connected via said pressure valve either with said pressure line or with the compressed air system, so that depending on an inherently present pressure in the pressure line upstream of the check valve or in a pressure system downstream of the check valve, the respectively higher pressure is utilized for actuation of the air relief valve, and

wherein the butterfly valve and the air relief valve are configured to be controlled independently of one another via respective drives for adjustment of a consumption-dependent position of the butterfly valve and for proportional regulation of a quantity delivered by the compressor.

2. A screw-type compressor according to claim **1**, wherein said control air line is connected to said pressure line, and wherein a pressure reservoir, for maintaining a pressure present in the compressed air system, is provided in said control air line.

3. A screw-type compressor according to claim **1**, wherein for adjustment of said butterfly valve, said adjustment cylinder is connected via a switching valve and a control oil line to a lubricating oil circuit provided for lubrication of bearings of said compressor unit.

4. A screw-type compressor according to claim **1**, wherein said adjustment cylinder is adapted to be operated pneumatically and is provided with further control air connections, wherein a second switching valve is connected to said further control air connections, and wherein a further control air line is provided that connects said second switching valve to said pressure side of said compressor unit.

5. A screw-type compressor according to claim **4**, wherein said further control air line for said adjustment cylinder is connected to a pressure reservoir.

6. A screw-type compressor according to claim **4**, wherein connection lines extend between said air relief valve and said switching valve for control air, and wherein said adjustment cylinder is connected with its control air connections, in a parallel connection relative to said air relief valve, to said connection lines.

7. A screw-type compressor, comprising:

a motor driven and dry operating compressor unit that has a suction side and a pressure side;

a butterfly valve disposed in an intake line connected to said suction side of said compressor unit;

an adjustment cylinder that is adapted to mechanically shift said butterfly valve;

a pressure line connected to said pressure side of said compressor unit, wherein said pressure line, via the interposition of a check valve, is adapted to be connected to a compressed air system for a supply of compressed air thereto; and

a pneumatically controlled air relief valve, wherein said pressure line is connected to said air relief valve via an air relief line for a relief of pressure during idling of said compressor unit, and wherein at least during idling of said compressor unit said air relief valve is adapted to be acted upon by the pressure that is effective on said pressure side of said compressor unit, wherein a valve piston

is disposed in said air relief valve, wherein during idling operation a piston chamber of said air relief valve is adapted to be acted upon with pressure for shifting said valve piston into a closed position for said air relief line, wherein a pressurizing line is provided and connects said piston chamber of said air relief valve to said air relief line, wherein a pressure relief line having a pressure relief valve is connected to said piston chamber, and wherein a forced control is established between the position of said butterfly valve and the position of said pressure relief valve.

8. A screw-type compressor according to claim **7**, wherein said pressure relief valve is disposed in the vicinity of a hub of said butterfly valve.

9. A screw-type compressor according to claim **8**, wherein said pressure relief valve is embodied as at least one opening that is disposed in said hub of said butterfly valve and is adapted to be opened and closed in an infinitely variable manner as a function of the position of said butterfly valve.

10. A screw-type compressor according to claim **9**, wherein said opening is embodied as a slot that extends over a portion of the periphery of said hub and is internally connected with said pressure relief line, and wherein said slot has an opening cross-section that is adapted to be adjusted by an adjusting member that is connected to said butterfly valve and determines said opening cross-section of said slot.

11. A screw-type compressor according to claim **8**, wherein said pressure relief valve comprises a recess that is disposed in a shaft of said butterfly valve and extends from a connection of said pressure relief line in the vicinity of said hub to externally of said hub.

12. A screw-type compressor according to claim **8**, wherein a plurality of pressure relief openings are formed on said hub.

13. A screw-type compressor according to claim **7**, wherein said air relief valve has two, selectively usable connections for blow-off air that is to be conducted away, wherein one of said connections is connected with said intake line, and wherein the other connection is connected to a muffler for the blow-off air.

14. A screw-type compressor according to claim **13**, wherein a valve seat for a connection of said air relief line to said air relief valve is rotatable in said air relief valve for said selective use of said connections.

15. A screw-type compressor according to claim **7**, wherein a stop element is provided for a fixation of an end closed position of said butterfly valve for setting an idling intake volume for single or multi stage screw-type compressors.

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